

PATENT APPLICATION COVER SHEET  
Attorney Docket No. 0132.67604

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Jan. 6, 2004  
Date

  
Express Mail No. EV032731236US

FASTENERS FOR COMPOSITE MATERIAL

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## **FASTENERS FOR COMPOSITE MATERIAL**

1           This application claims benefits under 35 U.S.C. § 120 based on provisional  
2 patent application Serial No. 60/471,050, filed May 16, 2003.

### **FIELD OF THE INVENTION**

5           This invention relates to fasteners for composite materials, and more particularly,  
6 to fasteners that reduce mushrooming and splitting in composite materials without predrilling,  
7 while adequately fastening the composite material to a substrate.

### **BACKGROUND OF THE INVENTION**

10           Modern composite building material is predominantly made of a combination of  
11 wood and plastic. Composite material can be used for various purposes, such as outside decks  
12 for houses.

13           When normal screws are used with such composite materials, the material tends to  
14 “mushroom” when the screw is countersunk, leaving a bump above the surface of the board.  
15 Conventional screws also tend to split the ends of the boards unless holes are pre-drilled, which is  
16 labor intensive. Thus, there is a need for screws for composite materials that reduce both  
17 mushrooming and splitting.

18           In many applications, composite material is fastened to an underlying substrate,  
19 such as wood. The fasteners must pass through the composite material and be firmly secured to  
20 the substrate.

1                   Accordingly, one object of this invention is to provide new and improved fasteners  
2 for composite material.

3                   Another object is to provide new and improved fasteners for composite materials  
4 that reduce mushrooming when the fastener is countersunk.

5                   Still another object is to provide new and improved fasteners for composite  
6 materials that reduce splitting without pre-drilling.

7                   Yet another object is to provide new and improved fasteners that adequately  
8 secure composite material to a substrate.

## 9 10                   SUMMARY OF THE INVENTION

11                   In keeping with one aspect of this invention, a fastener has a shaft, a head at a first  
12 end of the shaft, and a point at the other end of the shaft. A first portion of the shaft adjacent the  
13 point is threaded. The first portion typically extends about one-half the total length of the shaft.

14                   A second portion of the shaft (adjacent the head) is not threaded, but has a plurality of spaced  
15 rings. A knurled portion can be provided between the first and second portions, if desired.

16                   Conventional symmetrical or asymmetrical thread can be used in the threaded portion, or a full  
17 three lobe thread can be used.

## 18 19                   BRIEF DESCRIPTION OF THE DRAWINGS

20                   The above mentioned and other features of this invention and the manner of  
21 obtaining them will become more apparent, and the invention itself will be best understood by  
22 reference to the following description of an embodiment of the invention taken in conjunction  
23 with the accompanying drawings, in which:

Fig. 1 is a partially cut-away view of one embodiment of a fastener made in accordance with the present invention;

Fig. 2 is a an end view of the head of the fastener of Fig. 1;

Fig. 3 is an expanded view of the inside of the head of the fastener of Fig. 1;

Fig. 4 is a detailed view of the threads of the fastener of Fig. 1;

Fig. 5 is a partially cut-away view of a second embodiment of the present invention;

Fig. 6 is an end view of the head of the fastener of Fig. 5;

Fig. 7 is an end view of the threaded portion of the fastener of Fig. 5; and

Fig. 8 is a detailed view of a thread in the fastener of Fig. 5.

#### DETAILED DESCRIPTION

As seen in Fig. 1, a fastener 10 has a shaft 12 and a head 14 on one end of the shaft 12. The other end of the shaft 12 has a point 16, such as an approximately 30° point.

A first portion 18 adjacent the point 16 has a plurality of threads, while a second portion 20 adjacent the head 14 is not threaded. Three rings 22, 23, 25, spaced from each other at predetermined intervals, are provided in the second portion 20. It is contemplated that up to five rings would be suitable, depending on the nature of the material being fastened.

A knurl section 24 can be provided between the first portion 18 and the second portion 20, if desired. The knurl typically has a plurality of teeth oriented parallel to the axis of the shaft.

The head 14 (Fig. 2) can accept any suitable drive, such as the drive shown in Fig. 2, which has six lobes 27. An inside edge 26 of the head 14 can include an undercut 28, in which the edge is inverted towards the head 14, as seen in Fig. 3.

1           The rings are generally perpendicular to the axis of the shaft, can have a 50°  
2 beveled edge toward the head, and can be about .03-.02 inches thick. In Fig. 1, the spaces  
3 between the three rings are unequal. In a No. 8 size screw having 12 threads per inch and a  
4 nominal length of about 2.5 inches, the ring 22 can be about .560 to .540 inches from a bearing  
5 surface 33 of the head 14. The ring 23 can be about .395 to .375 inches from the surface 33, and  
6 the ring 25 can be about .17 to .15 inches from the surface 33. Other screw sizes and lengths can  
7 have rings spaced in a similar manner, depending on the material being fastened. Thus, if the  
8 total length of the shaft from the inside surface 33 of the head to the point 16 is TL, then the ring  
9 22 can be located about .23 TL from the surface 33, the ring 23 can be located about .16 TL from  
10 the surface 33, and the ring 25 can be located about .07 TL from the surface 33.

11           Threads 29 in the portion 18 can be any suitable thread design, such as the design  
12 shown in Fig. 4, in which the surface facing the point 16 is at about a 30° angle to a line (the apex  
13 of the thread) perpendicular to the shaft axis, and the surface facing the head 16 is at about a 15°  
14 angle to the same line.

15           A type 17 shank slot 30 or the like is typically provided adjacent the point 16. The  
16 slot 30 preferably would remove a full quadrant of the shaft 12 and thread 29.

17           A second embodiment of the present invention is shown in Figs. 5-8. A fastener  
18 50 includes a shaft 52, a head 54 at one end of the shaft, and a point 56 at the other end of the  
19 shaft. A first portion 58 (adjacent the point 56) is threaded, and a second portion 60 (adjacent the  
20 head 54) is not threaded, but has three equally spaced rings 62, 63 and 65. The threaded portion  
21 58 is about half the length of the shaft 52.

22           The head 54 can include any suitable drive, such as the square drive shown in Fig.  
23 6. In this embodiment, there is no undercut on an inside edge 73 of the head, although one could  
24 be provided, if desired.

1           A type 17 shank slot 70 or the like is typically provided adjacent the tip 56, shown  
2 in Figs. 5 and 7. Fig. 7 also shows that the threads 69 are formed in three radial lobes 64, each  
3 lobe spanning about 120° around the point 56.

4           As seen in Fig. 8, the threads 69 have one surface which forms about a 15° angle  
5 with a line 71 generally perpendicular to the axis of the shaft. That surface faces the point of the  
6 fastener. The opposite surface of the threads faces the head, and forms about a 5° angle with the  
7 line 71.

8           The rings 62, 63 and 65 are similar to the rings in the first embodiment, but are  
9 spaced differently along the shaft 52. In a No. 8 12 thread per inch screw, nominally 2.5 inches  
10 long, the ring 62 is located about .31-.30 inches from a bearing surface 73 of the head, the ring 63  
11 is located about .21-.20 inches from the surface 73, and the ring 65 is located about .11-.10 inches  
12 from the bearing surface 73. As with the first embodiment, different screw sizes and lengths  
13 would have rings spaced in similar proportions. For example, if the total length of the shaft from  
14 the bearing surface 73 to the point 56 is TL, then the ring 62 is located about .13 TL from the  
15 bearing surface 73, the ring 63 is located about .08 TL from the surface 73, and the ring 65 is  
16 located about .04 TL from the bearing surface 73.

17           In use, the fasteners of the present invention can be screwed into composite  
18 materials of varying densities without pre-drilling, and securely fasten the composite material to  
19 various substrates, without mushrooming or splitting the composite material.

20           While the principles of the invention have been described above in connection  
21 with specific apparatus and applications, it is to be understood that this description is made only  
22 by way of example and not as a limitation on the scope of the invention.